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Simultaneous X-ray and Radio observations of mode-switching radio pulsars PSR B0943+10 and PSR B1822-09

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With XMM-Newton, GMRT and LOFAR observations of the mode-changing near-aligned pulsar PSR B0943+10 we discovered synchronous switching in the radio and X-ray emission properties (Hermsen et al. 2013). These extraordinary findings were reported to support radio indications for rapid, global changes to the conditions in the magnetosphere. However, there is still no consistent interpretation for the X-ray mode switching. PSR B1822-09 is a fascinating pulsar exhibiting similar mode switching in the radio band. Mode switching in the radio emission of PSR B1822-09 is not only seen in its main-pulse and precursor emissions (like for PSR B0943+10), but also in that of its inter pulse. The latter switches in anti correlation with the main pulse. Radio data on PSR B1822-09 strongly suggest that it is an orthogonal rotator, but a near-aligned geometry is also discussed in literature. We organised for this pulsar in 2013-2014 a similar campaign of simultaneous XMM-Newton, GMRT, WSRT and Lovell observations. PSR B1822-09 does not show X-ray mode switching and exhibits X-ray characteristics that differ from those reported for PSR B0943+10, and that do not support the geometries discussed based on its radio properties. In this presentation we will compare the results from the two X-ray radio campaigns and discuss these in the context of competing theoretical emission models.

Hermsen et al., 2013, Science 339, 436

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